Self-sanitizing air-conditioning unit, and the relative sanitizing process

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Inventor: BEGHELLI GIAN PIETRO (IT)
Applicant: BEGHELLI SPA (IT)
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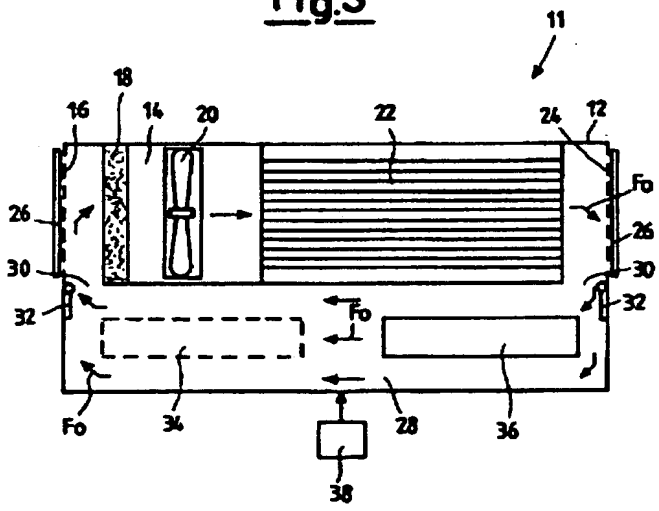
Abstract of **EP1079183**

A self-sanitizing air-conditioning unit (11) comprising a boxy container (12) crossed by the air to be treated, which forms a duct (14) whose extremities can be shut off by diaphragms (26) and which houses an evaporator (22). The duct (14) communicates with a sterilizing chamber (28) containing an ozonizer (34) and a catalyzer (36), where the ozonizer (34) and the catalyzer (36) are operable by a control device (38) so as to perform a sanitizing process comprising an ozonizing step in which the ozonizer (34) alone is operated and the extremity of the duct (14) are both shut off, and a catalyzing step in which the catalyzer (36) alone is operated, while the duct (14) is still closed.

Fig.3



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(71) Applicant: **Beghelli S.p.A.**
40050 Monteveglio, Bologna (IT)

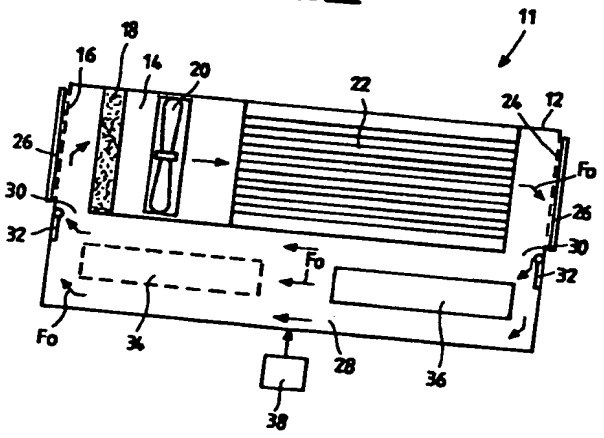
(72) Inventor: **Beghelli, Gian Pietro**
40050 Monteveglio (Bologna) (IT)

(74) Representative:
Parisi, Luigi et al
Ing. Barzanò & Zanardo Milano S.p.A.
Via Borgonuovo 10
20121 Milano (IT)

(54) **Self-sanitizing air-conditioning unit, and the relative sanitizing process**

(57) A self-sanitizing air-conditioning unit (11) comprising a boxy container (12) crossed by the air to be treated, which forms a duct (14) whose extremities can be shut off by diaphragms (26) and which houses an evaporator (22). The duct (14) communicates with a sterilizing chamber (28) containing an ozonizer (34) and a catalyzer (36), where the ozonizer (34) and the catalyzer (36) are operable by a control device (38) so as to perform a sanitizing process comprising an ozonizing step in which the ozonizer (34) alone is operated and the extremity of the duct (14) are both shut off, and a catalyzing step in which the catalyzer (36) alone is operated, while the duct (14) is still closed.

Fig.3



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Description

[0001] This invention refers to a self-sanitizing air-conditioning unit and the relative sanitizing process.

[0002] The air-conditioning units are known to be essentially composed of a pump which picks up a refrigerating fluid exiting from a condenser and conveys it to an evaporator held at a pressure which is higher than the condendenser pressure. The evaporator is in turn connected to the same condenser by a valve which may be of a different type but which in any case allows maintaining the pressure differential between the condenser and the evaporator.

[0003] In particular, the evaporator is constituted by a heat exchanger set into a duct through which the external air to be cooled is passed, before being conveyed into an environment whose conditions, in particular the temperature, are kept under control.

[0004] Such conventional air-conditioning units are notoriously subject to a contamination caused in their interior by bacterial or fungal growths as well as by the deposition of organic matter, dust or other impurities.

[0005] The contaminating phenomenon is particularly undesirable when it occurs inside the air duct, as in this case the contaminating materials are frequently entrained in the air crossing the duct whenever the unit is started up, and thus introduced into the air-conditioned environment. When this occurs, the contaminating materials may occasionally turn out to be harmful to the health of any persons dwelling in the air-conditioned premises, for instance by causing asthma or other unpleasant syndromes.

[0006] The purpose of this invention is therefore to eliminate the mentioned technical drawbacks, by creating a self-sanitizing air-conditioning unit capable of being sterilized in an essentially simple manner, so that the operation of the same fails to introduce some contaminating materials into the air-conditioned premises, which may turn out to be harmful or at any rate disagreeable to those dwelling inside.

[0007] Another purpose of the invention is to produce an air-conditioning unit capable of automatically sterilizing itself, without the need for an operator to initiate such an operation.

[0008] An additional purpose of the invention is to produce an air-conditioning unit incapable of introducing foreign harmful materials.

[0009] A further purpose of the invention is to produce a self-sanitizing air-conditioning unit of an essentially inexpensive, safe and reliable type.

[0010] Not the last purpose of the invention is to create a sanitizing process capable of being implemented by a self-sanitizing air-conditioning unit according to this invention.

[0011] These and other purposes according to this invention are achieved by producing a self-sanitizing air-conditioning unit according to claim 1.

[0012] Such an air-conditioning unit according to this invention implements a sanitizing process according to claim 11.

[0013] Other characteristics of this invention are further defined by the subsequent claims.

[0014] Further characteristics and advantages of the self-sanitizing air-conditioning unit and the relative sanitizing process according to this invention will become more clearly evident from the following description, offered for exemplifying an d non-limiting purposes, referred to the simplified attached drawings, in which:

Figure 1 offers a simplified view of an air-conditioning unit according to this invention, during a conditioning phase in which the conditioned air is introduced into an environment,

Figure 2 offers a simplified view of the same portion of the air-conditioning unit of Figure 1, during a sterilizing phase based on ozonizing its component parts, and in particular the evaporator,

Figure 3 shows the same portion of the air-conditioning unit of Figure 1, during a catalyzing phase preparing it for the subsequent sterilizing phase.

[0015] With reference to the mentioned figures, a portion of a self-sanitizing air-conditioning is shown in its overall form by the number 11.

[0016] The unit 11 comprises a boxy container 12, which houses a duct 14 through which the air to be treated is passed.

[0017] The duct 14 presents at one of its extremities an inlet through which the air to be treated, indicated by Fi, enters in its interior, a protective and encompassing grille 16.

[0018] A filter 18, a ventilator 20 and an evaporator 22 follow the grille inside the duct 14.

[0019] Behind the evaporator 22, the duct 14 is equipped with a second protective and encompassing grille 24 through which the treated air Fu exits.

[0020] Each of the two access openings to the duct 14 can also be shut off by a sliding diagram 26.

[0021] The duct 14 communicates with a sterilizing chamber 28 by two openings 30 placed at the opposite extremities of the duct 14. These openings 30 can be closed off by doors 32 hinged to the same container 12 and capable of being operated by stepping motors.

[0022] The inside of the chamber 28 houses an ozonizer 34, based on a known art, capable of producing and feeding ozone to the chamber 28 and a catalyzer 36, also of a known type, capable of eliminating the ozone which is harmful for human organisms.

[0023] The air-conditioning unit according to this invention also comprises an electronic control system 38 such as a PLC equipped with a timing device as a control element, which controls the opening and closing of the diaphragms 26 in addition to the electric motors for the doors 32, and also starts or interrupts the operation of the ozonizer 34 and the catalyzer 36.

[0024] While operating, the self-sanitizing air-condi-

tioning unit according to this invention performs a sanitizing process essentially as follows.

[0025] In a conditioning phase, as shown in Figure 1, both openings 30 are obscured by the doors 32, while both extremities of the duct 14 are open to allow the access of the air to be treated FI and the exit of the treated air Fu from the duct.

[0026] In this configuration, the ventilator 20 draws air, which crosses the grille 16 and filter 18 and is then passed around the evaporator 22. The air is therefore cooled and conveyed to the environment to be conditioned, after passing the grille 24.

[0027] At pre-established intervals, the timer of the processor 38 automatically starts the sterilization of the unit 11.

[0028] When this happens, the processor 38 controls the opening of both of the openings 30, by rotating the doors 32, and the simultaneous closing of the extremities of the duct 14, by sliding the diaphragms 26.

[0029] This starts the ozonizer 34 to produce ozone, which produces a mixture with air, indicated by Fo in Figures 2 and 3. The mixture Fo is then circulated through the unit 11, between the duct 14 and the chamber 28 of the ventilator 20. In this phase the fungi, bacterial floras, mildews and the like are attacked and destroyed by the ozone. The sterilizing phase has a duration which can be pre-set by acting on the electronic processor 38.

[0030] After the sterilizing phase, the processor 38 controls a catalyzing phase, which eliminates the ozone in the unit 11.

[0031] During the catalyzing phase shown in Figure 3, the openings 30 are still open and the mixture Fo contained in the unit 11 is still circulating between the duct 14 and the chamber 28. In this phase, however, the catalyzer 36 is actuated in place of the ozonizer 34, so as to totally eliminate the ozone after a certain operating time, and to return to clean air. This phase can also be pre-set by acting on the processor 38.

[0032] Finally, when the sterilizing and catalyzing phases are concluded, the processor 38 returns the unit to a conditioning mode by re-opening the extremities of the duct 14 and closing the openings 30 by using the doors 32.

[0033] It has in practice been shown that the self-sanitizing air conditioning unit and the relative sanitizing process according to this invention are particularly advantageous, as they allow eliminating the contaminating materials from the unit, without risking the immission into the conditioned environment of any materials differing from the contaminating ones, which may prove harmful to the organisms of the persons dwelling in the air-conditioned premises.

[0034] The self-sanitizing unit and the relative sanitizing process thus conceived are susceptible to numerous modifications and variants, all falling within the scope of the invention; moreover, all the details may be substituted by others of a technically equivalent type.

[0035] In practice the materials as well as their dimensions used may be of any type, depending on the technical requirements.

Claims

1. A self-sanitizing air-conditioning unit (11) comprising at least one boxy container (12) crossed by the air to be treated, which forms a duct (14) whose extremities can be closed by diaphragms (26) and which houses at least one evaporator (22), characterized in that said duct (14) communicates with a sterilizing chamber (28) containing at least one ozonizer (34) and a catalyzer (36), where the said ozonizer (34) and catalyzer (36) are operable by a control system (38) so as to generate a conditioning phase in which they are both shut-in and the extremities of the duct (14) are both open, an ozonizing phase in which the ozonizer (34) alone is operated and the extremities of the duct (14) are both closed, and a catalyzing phase in which only the catalyzer (36) is operated and both of the extremities of the duct (14) are still closed.

2. An air-conditioning unit (11) according to claim 1, characterized in that said duct (14) has an opening at one of its extremities, through which the air to be treated (FI) enters into its interior, and at least one first protective and encompassing grille (16).

3. An air-conditioning unit (11) according to claim 2, characterized in that the inside of said duct (14) contains at least one filter (18) positioned in series to said first grille (16).

4. An air-conditioning unit (11) according to claim 3, characterized in that the inside of said duct (14) contains at least one ventilator (20) positioned in series to said filter (18).

5. An air-conditioning unit (11) according to claim 1, characterized in that behind said evaporator (22), said duct 14 is equipped with at least one second protective and encompassing grille (24), through which the treated air (Fu) exits.

6. An air-conditioning unit (11) according to claim 1, characterized in that said duct (14) communicates with said sterilizing chamber (28) by at least two openings (30) placed at the opposite extremities of said duct (14).

7. An air-conditioning unit (11) according to claim 6, characterized in that said openings (30) may be obscured by doors (32).

8. An air-conditioning unit (11) according to claim 7, characterized in that said doors (32) are hinged to

said boxy container (12) and can be operated by stepping motors.

9. An air-conditioning unit (11) according to claim 8, characterized in that said control system (38) controls the opening and the closing of said diaphragms (26), as well as said stepping motors of said doors (32).

10. An air-conditioning unit (11) according to claim 1, characterized in that said control system (38) is constituted by an electronic control device or PLC.

11. A sanitizing process of an air-conditioning unit (11), characterized in that it comprises an ozonizing phase during which the internal parts of said unit (11) are brought in contact with a mixture (Fo) containing at least air and ozone, and a catalyzing phase, in which said ozone is eliminated from said mixture (Fo).

12. A sanitizing process of an air-conditioning unit (11), characterized in that it is automatic.

Fig.1

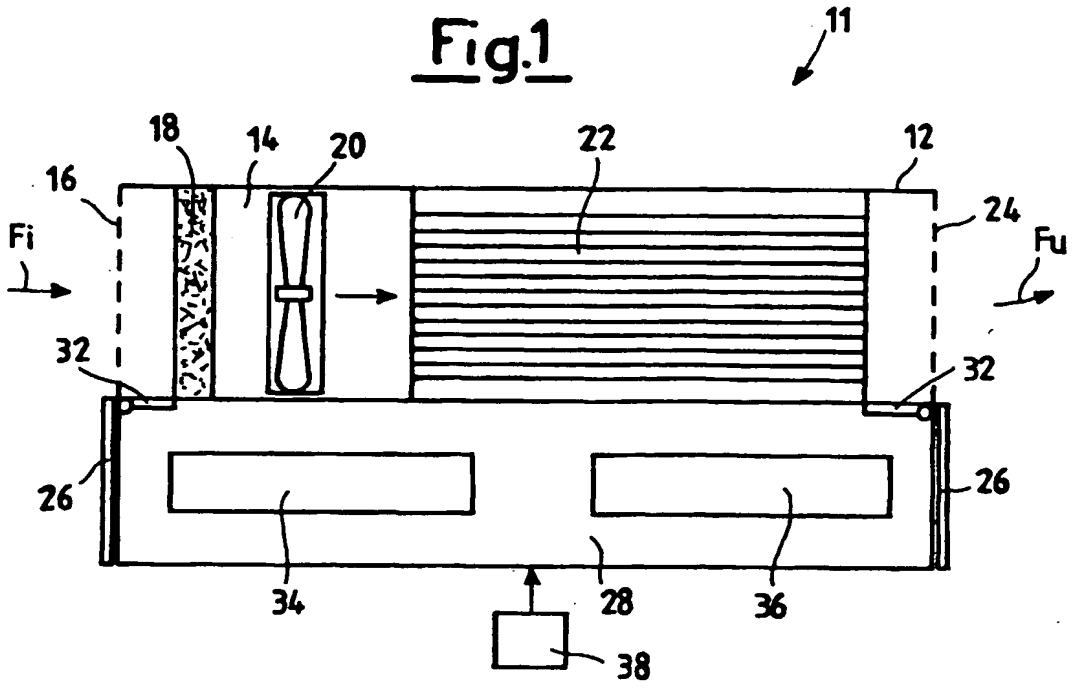
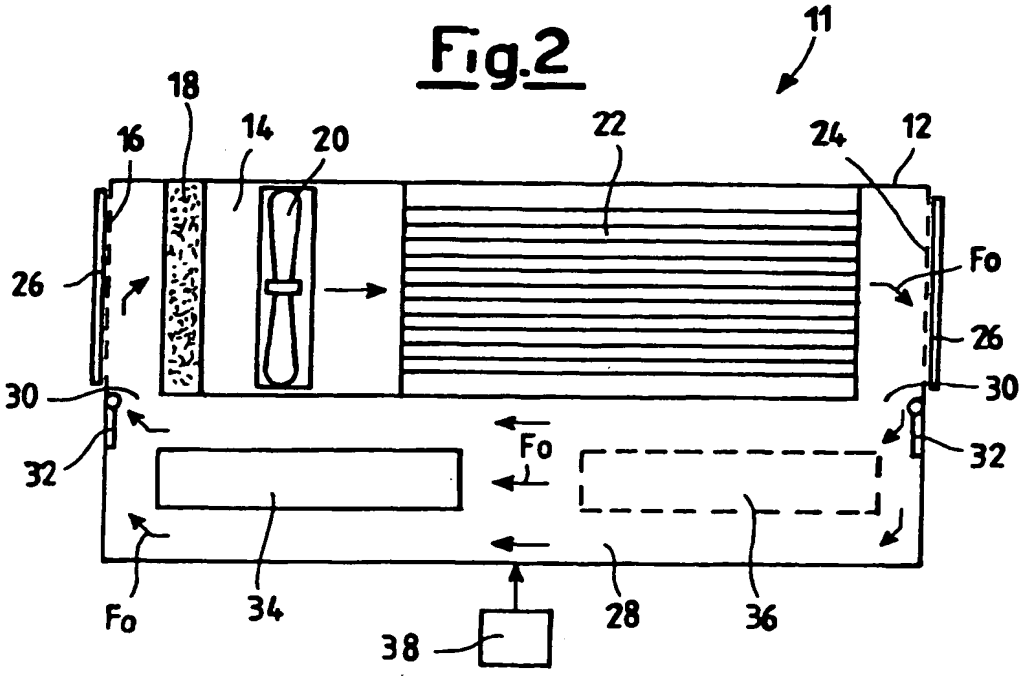

11
18
14
20
22
12
16
24
Fi
Fu
32
32
26
26
34
28
36
38

Fig.2


11
18
16
14
20
22
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12
Fo
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26
30
30
32
Fo
32
Fo
34
28
36
38

Fig.3